

West Valley site history, cleanup status, and role of the West Valley Citizen Task Force

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West Valley Citizen Task Force

***DOE National Transportation Stakeholders Forum
Buffalo, May 16, 2013***

WEST VALLEY SITE

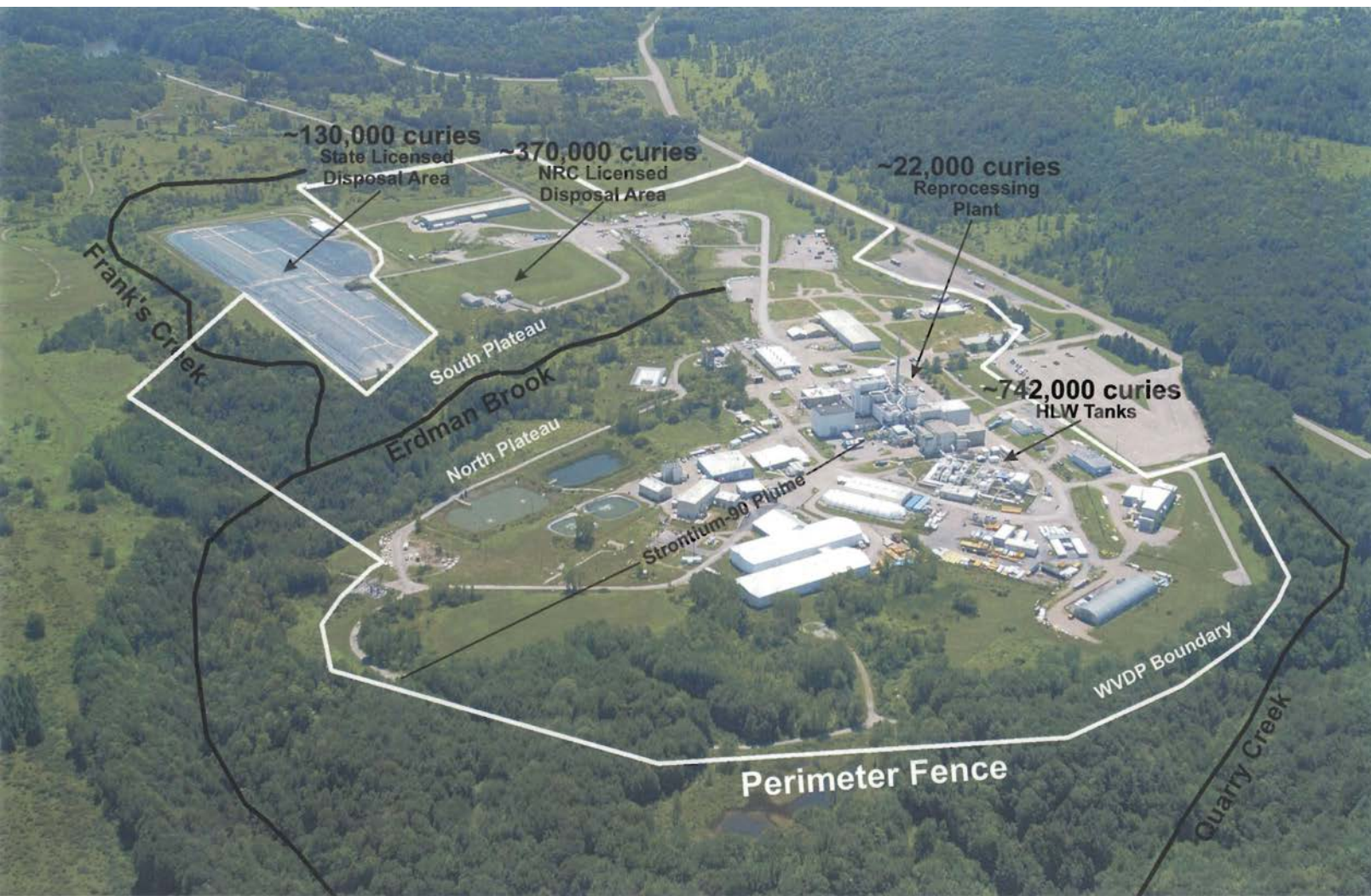
- **Only U.S. commercial reprocessing plant (1966-1972)**
- **Owned by NY State; operated by Nuclear Fuel Services**
- **Reprocessed both defense and commercial spent fuel**
- **High worker exposures, poor control of contaminants during period of operation prior to 1980**
- **Sited on erosion-prone land (glacial fill) in the Great Lakes watershed, about 50 km (30 mi) south of Buffalo**
- **Two onsite burial grounds operated 1963-1975; hold wastes exceeding 10 CFR 61 limits**
- **Onsite source term includes HLW, TRU, LLW, mixed waste (roughly 16 million curies current total)**

WEST VALLEY SITE

- **A site-specific federal law (West Valley Demonstration Project Act) was passed in 1980 to deal with liquid HLW and to decommission part of the site**
- **DOE has successfully vitrified HLW from reprocessing:**
 - **Vitrified HLW is commingled defense and commercial waste**
- **Joint state-federal decommissioning is ongoing w/public input including West Valley Citizen Task Force**
- **Major decommissioning decisions have been deferred until 'Phase 2' decision – to be made in about 7 years**
- **Many issues remain (funding, full cleanup?, HLW disposal). Full cleanup price tag is about \$10 billion.**

WEST VALLEY SITE

Vitrified HLW (about 15 million curies) is temporarily stored in reprocessing plant; will be moved soon to onsite dry casks.



BURIAL GROUNDS

Two onsite disposal areas operated 1963-1975: State-licensed 'SDA' accepted radioactive waste from offsite facilities. Fuel hulls and other reprocessing wastes were buried in the adjacent 'NDA' under AEC (later NRC) license.

**Waste
emplacement
by Nuclear
Fuel Services
in one of 14
SDA trenches**



REPROCESSING

- From 1966 to 1972, the West Valley plant reprocessed 630 tons of fuel from 9 reactors during 28 campaigns
- About 60% of the fuel came from the U.S. Atomic Energy Commission (AEC) as part of its guarantee to supply fuel until an adequate commercial market grew
- Fuels processed included light-water reactor fuels (both BWR and PWR), fuels from AEC-owned reactors (esp. the Hanford N-Reactor), and uranium-thorium fuel from the Indian Point 1 reactor
- Both metal and oxide fuels were processed; burnup ranged up to 30,000 MWd/MTU
- Very dirty operation! *High emissions and worker doses.*

REPROCESSING: Dirty operation at West Valley

- 1968 = 2.74 rem/person
- 1969 = 3.81 rem/person
- 1970 = 6.76 rem/person
- 1971 = 7.15 rem/person

These are *average whole-body exposures* for approx. 250 individual workers. They are *not collective dose*.

When it appeared that the above doses were becoming excessive, up to 1400 temporary workers per year were brought in for high-dose jobs.

Sources: *ORAU Team Dose Reconstruction Project for NIOSH*, ORAUT-TKBS-0057 (2007), p. 35. A 1978 Battelle-Columbus report lists a slightly higher average (7.23 rem/person) for the 1971 dose. Temporary workers: Robert Gillette, *Science* 186, 125-129 (1974).

REPROCESSING: Dirty operation at West Valley

- High emissions to air and water; contaminant plumes; various technical problems
- For example, during a 6-month period in 1969, the plant's discharges to the aqueous environment (meaning creeks that flow toward the Seneca Nation of Indians and Lake Erie) included:

1700 Ci tritium

2 Ci cesium-134

52 Ci ruthenium-106

8.3 Ci strontium-90

8 Ci cesium-137

Etc.

Source: P. Magno et al., *Liquid Waste Effluents from a Nuclear Fuel Reprocessing Plant*, U.S. Dept. of Health, Education, and Welfare, Public Health Service, Bureau of Radiological Health, November 1970, BRH/NERHL 70-2, page 38.

Reprocessing at the West Valley site ended in 1972, leaving 600,000 gallons of high-level liquid waste.

Waste burial at the site ended in 1975.

The site operator (*Nuclear Fuel Services*) and site owner (*New York*) disagreed with each other and *had not set aside enough money* to deal with the various site issues.

May, 1977
Price, \$2.00

Also in this issue:

Politics in Urban Transportation
Converting Sunlight by Chemistry
The Promise of the Space Factory

Technology Review

Edited at the Massachusetts Institute of Technology

**600,000 GALLONS
OF HIGH LEVEL
RADIOACTIVE WASTE
LIE IN A TANK AT
WEST VALLEY, NY.
THE TANK WILL
EVENTUALLY CORRODE.
WHAT SHOULD BE
DONE? WHO SHOULD
DO IT?**

WEST VALLEY DEMONSTRATION PROJECT

Congress passed the West Valley Demonstration Project Act in 1980, signed by President Carter, bringing DOE onsite:

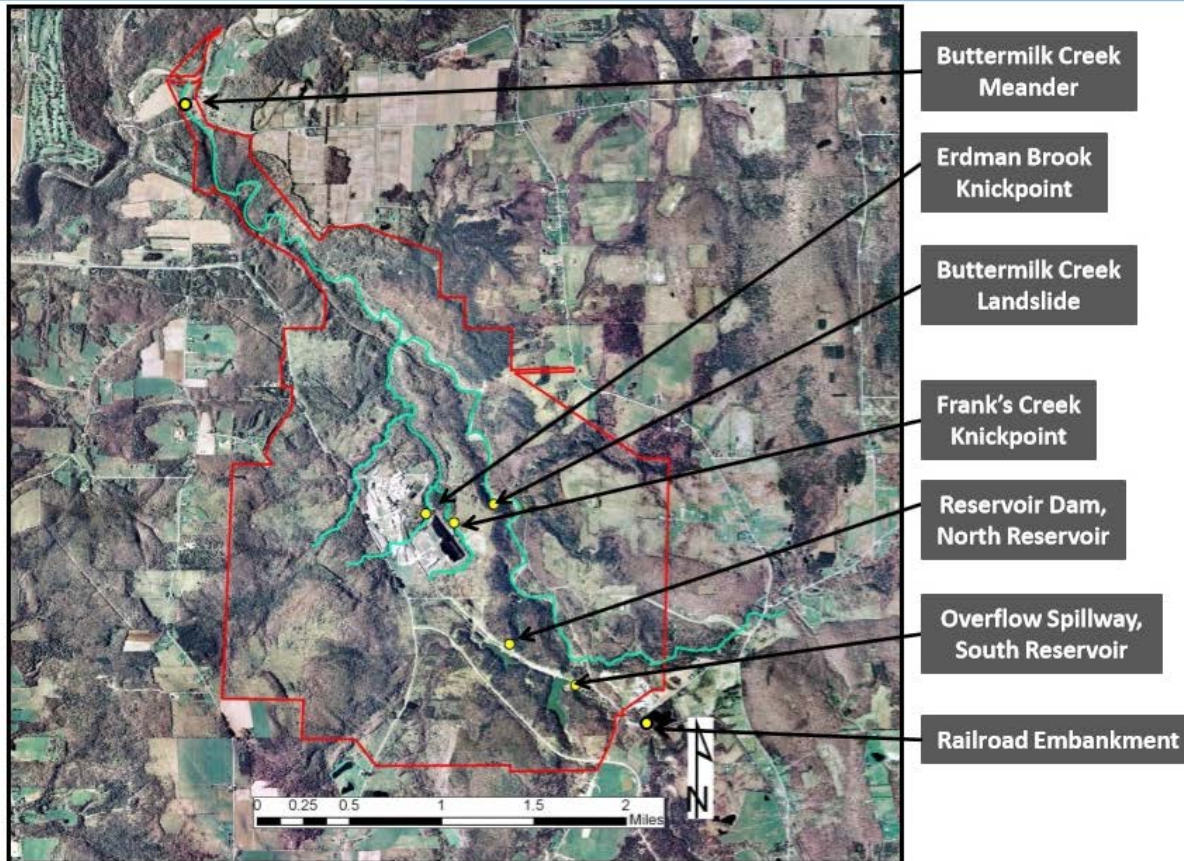
- **The Act was based on discussion and recognition of substantial federal role in promoting reprocessing**
- **90% federal, 10% state funding; role of NYSERDA**
- **Solidification and disposal of West Valley HLW, with decon/decommissioning of substantial parts of site**
- **DOE has successfully (and safely) vitrified the HLW in accordance with the Act – but HLW is not yet removed for disposal. *HLW canisters are in the way, need to be moved.***
- **Extent & details of site decommissioning still not decided: \$2.5 billion spent to date; \$10 billion full cleanup???**

WEST VALLEY SITE

The site drains to Lake Erie and is located on erodible glacial fill (>100 m thick) in a geomorphically active area with high topographic relief & steep stream gradients.



Western New York Nuclear Service Center



Drainage:
High-gradient “flashy” creeks from the site to Lake Erie, then Niagara River to Lake Ontario.

Joshi (1988) has identified radionuclides from old West Valley releases in Lake Ontario sediments off the mouth of Niagara River.



Buttermilk Creek Landslide



50 m



EROSION = MAIN THREAT TO SITE INTEGRITY

- Long-term erosion (geomorphic downcutting/widening of stream valleys, formation of new ravines) *will cut into buried wastes*, thus exposing and carrying downstream a large portion of any remaining source term
- This is a recognized problem – *but over what time frame?*
- DOE's 1996 Draft EIS predicted ~300,000 mrem/yr dose to a downstream resident in a few hundred years due to uncontrolled erosion. This Draft EIS led to:
 - Massive public and agency criticism
 - Ongoing DOE reassessment of its erosion-prediction methodology (controversial - *new studies may resolve*)
 - Formation of the West Valley Citizen Task Force by DOE and NYSERDA to provide direction and advice on the development of a Preferred Alternative

EIS PROCESS

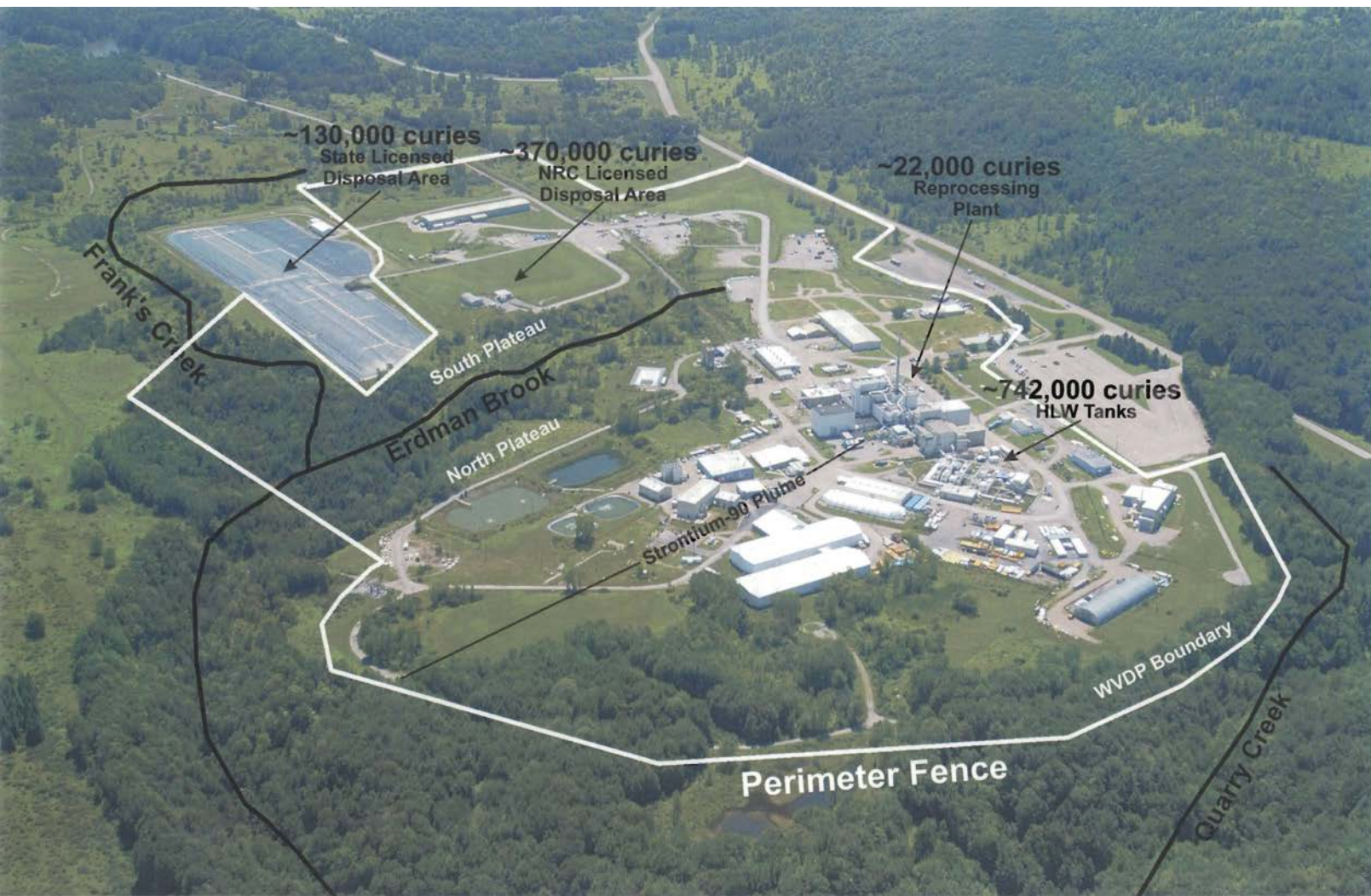
- **2010 ‘Phase 1’ EIS predicted much lower erosion and much lower doses than had been predicted in the 1996 Draft EIS**
- **2010 ‘Phase 1’ ROD decided to demolish and remove main plant building – but deferred decisionmaking (for 10 years) on the two burial grounds and the mostly-empty HLW tanks**
- **‘Phase 1’ studies have been initiated on key topics, including erosion, that need better resolution**
- **Climate change to be considered in studies – details TBD?**
- **‘Phase 2’ decision expected in 2020; should determine whether the two burial grounds and the mostly-empty HLW tanks will be exhumed or closed in place**
- **Funding remains an issue**

TRANSPORTATION ISSUES

- Highway and rail infrastructure need to be maintained (for decades?) for offsite disposal of various West Valley wastes, especially if forthcoming 'Phase 2' decision calls for complete site remediation
 - *Economic viability* of Buffalo & Pittsburgh (BPRR), a Class II railroad, part of Genesee & Wyoming system
 - *Erosion issues* in maintaining rail lines (contributing factor in closure of BPRR north of the site; ongoing problem for track that connects site to BPRR mainline)
- **Vitrified West Valley HLW (275 canisters) needs to be transported offsite for disposal as per WVDP Act**
 - *Should be among the waste forms qualified for removal to consolidated interim storage* – would avoid cost of creating new temporary storage onsite

WEST VALLEY SITE

Vitrified HLW (about 15 million curies) is temporarily stored in reprocessing plant; will be moved soon to onsite dry casks.



WEST VALLEY CITIZEN TASK FORCE (CTF)

- **Formed in 1997 by DOE & NYSERDA to provide direction and advice on the development of a Preferred Alternative**
- **CTF 'Final Report,' issued unanimously by its 16 members in 1998, called for a Preferred Alternative that will protect human health and the environment; also expressed belief that site is not suitable for long-term, permanent storage or disposal of wastes, etc. (The report is 6 pages plus signatures and Seneca Nation of Indians concurrence.)**
- **CTF continues to meet approximately monthly to review information on site cleanup processes and progress, including the 'Phase 1' studies that are now underway; also to advise DOE and NYSERDA and other involved agencies, report back to the public, recommend adequate funding for site activities, etc.**

WEST VALLEY CITIZEN TASK FORCE (CTF)

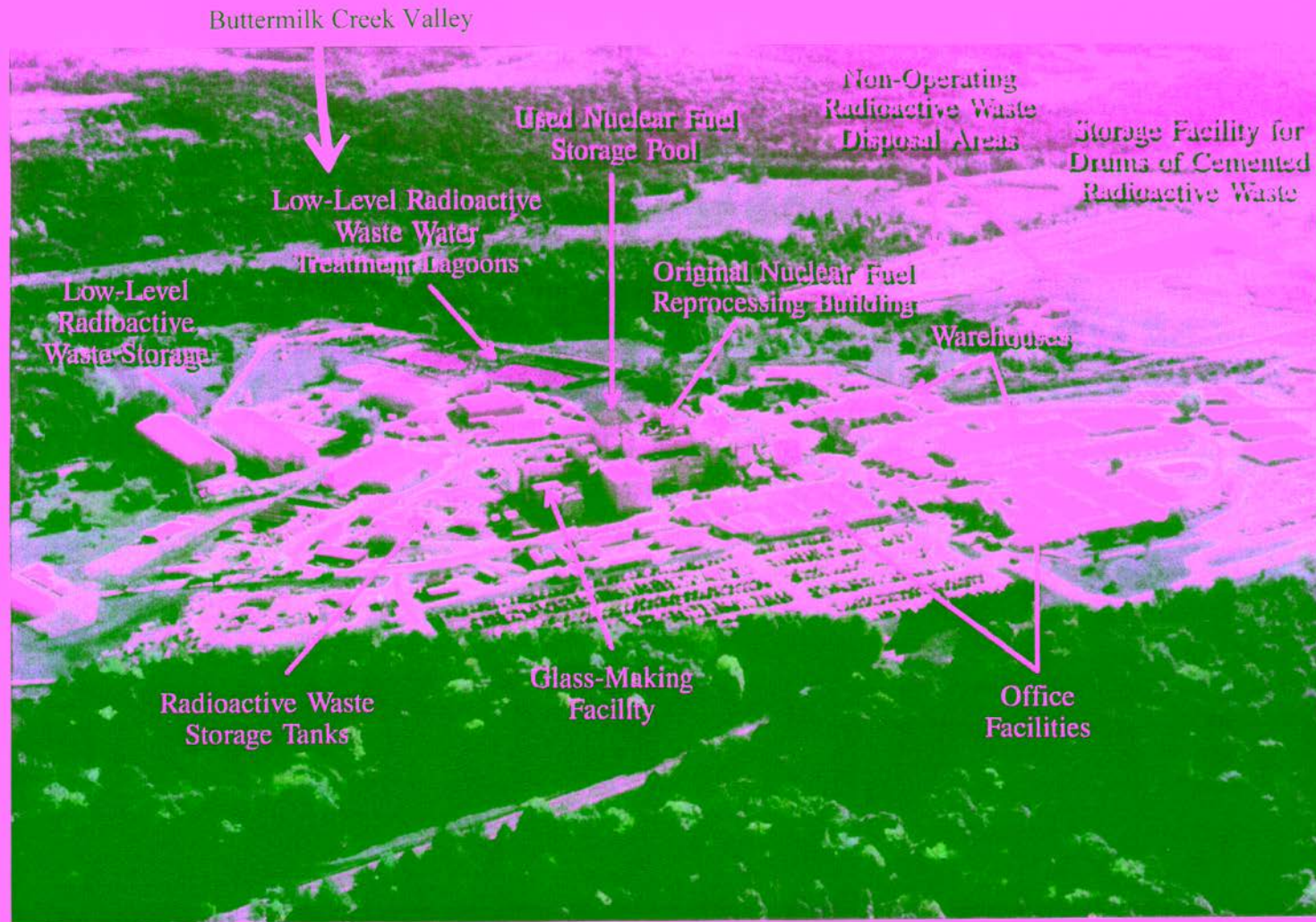


2010 photo

Trip to Washington,
Feb. 2013



WEST VALLEY SITE



← North

WEST VALLEY SITE

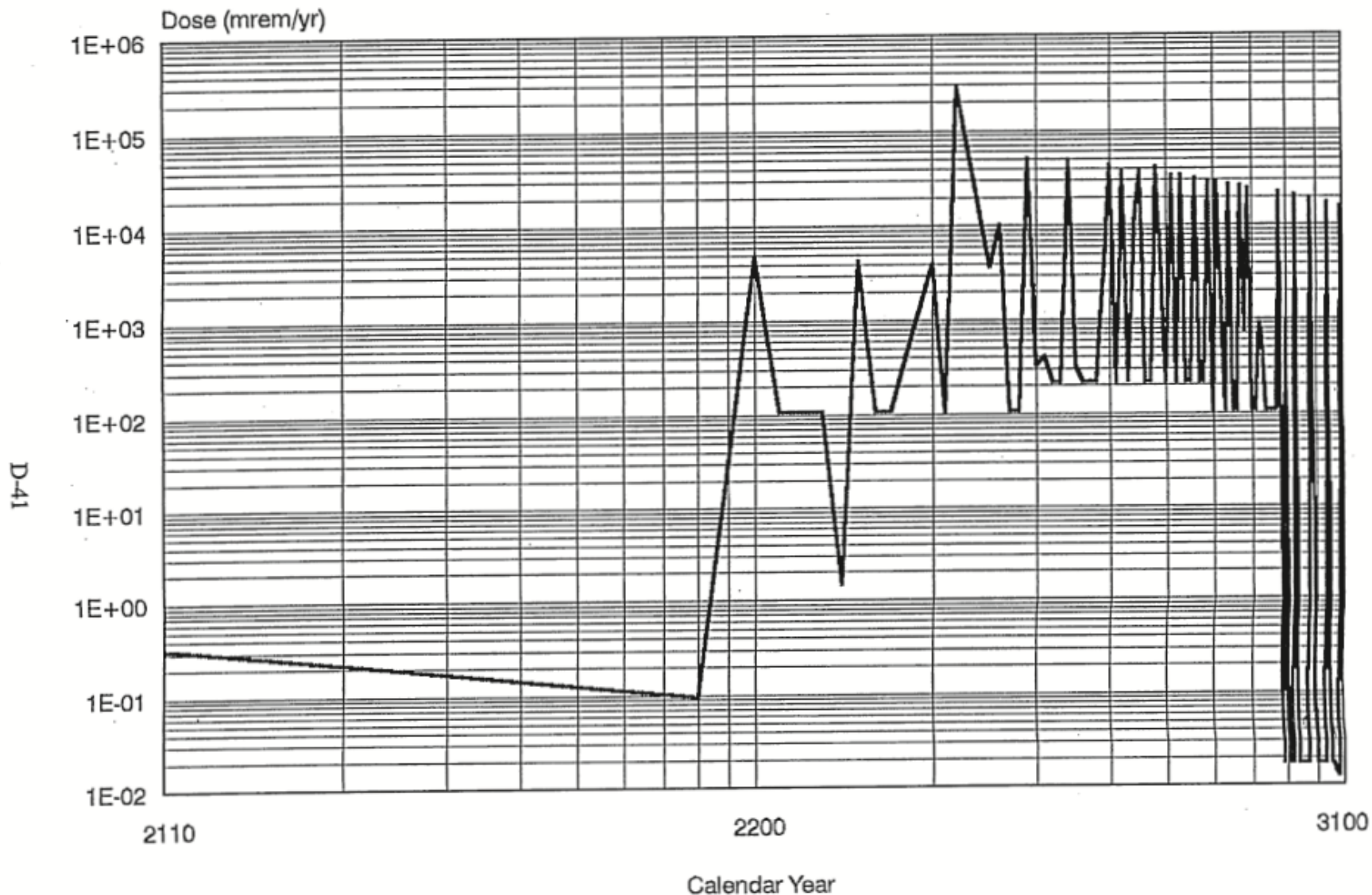


Figure D-8. Alternative III Assumed Loss of Institutional Control Case, Local Erosion Control Strategy: Erosion Collapse Scenario, Cumulative Impacts for a Buttermilk Creek Resident

"Transient" Nuclear Workers: A Special Case for Standards

Buffalo, New York. For the Buffalo area's unemployed laborers, for the moonlighters, college students, and the young men recruited from small farming towns south of the city, the guarantee of half a day's pay for a few minutes' work was an offer they couldn't refuse. Attracted by the prospect of easy money, they flocked by the hundreds to the Nuclear Fuel Services company between 1966 and the middle of 1972 to perform some of the dirtiest jobs in what one official of the Atomic Energy Commission (AEC) calls "the dirty end of the nuclear business."

The business of Nuclear Fuel Services (NFS) is the chemical extraction of uranium and plutonium from the highly radioactive spent fuel rods of nuclear power reactors. Situated in pastoral, wooded hills 40 miles south of Buffalo, the chemical plant was the nation's first commercial fuel processing facility. Although the technology it used was far from experimental, the NFS plant proved less than a smashing technical success. Almost from the time it opened in 1966 until it ceased operating in June of 1972 (for a major repair and enlargement program to be finished in 1977) the plant suffered repeated breakdowns and leaks of radioactivity. To clean things up and make repairs, the company relied heavily on the Buffalo area's abundant labor pool.

During 5½ years of operation, according to correspondence between NFS and the AEC, the company each year hired an average of 1400 "supplemental" workers from surrounding communities, making up a temporary, continually changing work force that outnumbered the plant's permanent, trained operating staff by more than 10 to 1. With an apparent minimum of instruction in safety procedures and the potential hazards of their jobs, the supplemental men were put to work decontaminating equipment and working areas, burying low-level nuclear waste, and repairing radioactive equipment.

Some of these workers were as young as 18 and others are alleged to have been recruited from bars for an afternoon's work. Some would last a week or more on the job. Others reached legal exposure limits within minutes and were promptly paid off—half a day's pay (at around \$3 an hour)—and replaced, in the derisive phrase of a former full-time employee, by "fresh bodies."

On the average, according to AEC inspection reports, the plant's temporary workers received a whole-body radiation dose of 1.73 to 2 rems, an amount not considered harmful, but the equivalent nevertheless of five chest x-rays. This is less than the maximum

the AEC allows for full-time radiation workers but much more than the industrywide average of 0.2 rem per year and more than the 0.5 rem allowed for members of the general public.*

The temporary workers, like the plant's permanent staff, also were exposed to small airborne concentrations of plutonium and other radioactive fission products whose hazards are under debate (*Science*, 20 and 27 September).

At one time the plant and its radioactive effluents were the focus of environmental protests, but these objections largely subsided, first as waste treatment improved and later when the plant closed. The company's public relations efforts have generally been effective, and a predominantly blue-collar region now seems to regard NFS as a welcome source of jobs. Local opposition to a planned tripling of the plant's capacity thus have been limited to a handful of conservationists and a few families whose sons worked at the plant. It is expected to reopen in about 3 years, at which time, AEC officials say, the plant will be much cleaner. If it isn't, one official adds, "we're in trouble."

Dormant as it is right now, the NFS plant provides a particularly vivid example of a common and long-standing practice in the nuclear industry. The AEC has long condoned the use of

* Federal radiation protection guidelines in force since 1960 recommend that individuals in the general population receive no more than 0.5 rem per year of nonmedical radiation to the whole body. Nuclear workers are limited to 5 rems per year, but the guidelines allow a worker to accumulate unused exposure according to the formula $5(n-18)$ where n is his age. The worker may draw on his "body bank" at a rate up to 3 rems per quarter or 12 rems per year.

Directs Ray [unclear]
BRH-NEERHL 70-2

LIQUID WASTE EFFLUENTS
from a NUCLEAR FUEL
REPROCESSING PLANT



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

WEST VALLEY-DERIVED RADIONUCLIDES IN THE NIAGARA RIVER AREA OF LAKE ONTARIO

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(Received May 11, 1987; revised November 12, 1987)

Abstract. The presence of West Valley-derived radionuclides in the densely-populated Niagara River/Lake Ontario region is demonstrated through measurements on water and sediment samples. The ^{137}Cs profile in a ^{210}Pb -dated Lake Ontario sediment core is consistent with the pattern of West Valley discharges to the local aquatic environment in that the observed ^{137}Cs activity maximum corresponds to the 1970 peak discharge and not the 1963 fallout peak activity. Preliminary mass balance estimate, based on a $^{137}\text{Cs}/^{90}\text{Sr}$ activity ratio of 1.5 and on the assumption that the dominant regional flow of Lake Erie transports most of the radionuclides to Lake Ontario via the Niagara River, shows that nearly all of the West Valley-delivered ^{137}Cs is deposited in the bottom sediments of Lake Ontario. It is suggested that any accidental releases of radioactivity from the site are likely to provide additional radiation dose to the area residents using municipal water supplies.

1. Introduction

The pollution of the densely-populated Niagara River/Lake Ontario region is a topic of major concern. The salient features of the area pollution by toxic organic compounds (Kaiser, 1974) and heavy metals (Thomas, 1972) are continually being defined (Durham and Oliver, 1983; Mudroch, 1983). The existence of several nuclear facilities in the drainage basin (IJC, 1979) leads to the possibility of contamination of this area by radioactive materials as well. By far the most toxic radioactive materials are stored at the Western New York Nuclear Service Center (WNYNSC), located at West Valley, N.Y. The site comprises the first commercial nuclear fuel reprocessing plant in the United States and various storage, treatment and burial areas for radioactive wastes. Although no fuel has been reprocessed since 1972, releases of controlled amounts of radioactive wastes to the local drainage system have continued (NYSDEC, 1967–1982). The average 1969–1971 ^{90}Sr levels resulting from such releases to the adjoining Cattaraugus Creek, which empties into Lake Erie, exceeded both the U.S. Environmental Protection Agency's standard for drinking water and the U.S. Nuclear Regulatory Commission's technical specifications for the creek (IJC, 1983). Besides controlled releases, the possibility also exists that radioactivity may be accidentally released to the local aquatic ecosystem. Indeed, in 1976, rising waters in two trenches had broken through their soil cover (Ecker and Onishi, 1979). Although much information has accumulated concerning the levels of radioactivity around the WNYNSC (NYSDEC, 1976–1982; Ecker and Onishi, 1979; Onishi *et al.*, 1981), the same cannot be said about the fate of West Valley radionuclides following their entry into Lake Erie and possible, but as yet uncharacterized, transport to Lake Ontario via the Niagara River. Bowen

WEST VALLEY PLUTONIUM AND AMERICIUM-241 IN LAKE ONTARIO SEDIMENTS OFF THE MOUTH OF NIAGARA RIVER

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Abstract. Recently deposited fine-grained sediments in Lake Ontario off the mouth of Niagara River contain highly toxic ^{238}Pu , $^{239,240}\text{Pu}$, and ^{241}Pu (^{241}Am) from global fallout as well as from low level releases of these radionuclides from the West Valley radioactive waste management site. This is demonstrated through sediment core radionuclide inventories, radionuclide activity ratios, and assignment of independently-derived ^{210}Pb dates to sediment core segments. Reasonable agreement between measured and calculated inventories, derived using various assumptions and available discharge and environmental monitoring data, suggests that nearly all of the West Valley-derived $^{239,240}\text{Pu}$ and ^{241}Am resides in the bottom sediments of Lake Ontario, comprising about 36 and 80%, respectively, of the measured (1982) inventories of these radionuclides. The West Valley ^{241}Am is largely derived from the decay of ^{241}Pu and, assuming negligible further deliveries of ^{241}Pu (^{241}Am), its growth is expected to continue until about 2040.

1. Introduction

The Western New York Nuclear Service Center (WNYNSC), located at West Valley, NY, U.S.A. comprises the first commercial nuclear fuel reprocessing plant in the United States and various storage, treatment and burial areas for radioactive wastes. Although no fuel has been reprocessed since 1972, releases of controlled amounts of radioactive wastes to the local drainage system have continued (NYSDEC, 1967–1982). Ecker and Onishi (1979) and Onishi *et al.* (1981) have studied the local aquatic system extensively and have reported the presence of West Valley-derived radionuclides near the confluence of Cattaraugus Creek and Lake Erie. The pertinent section of the eastern end of Lake Erie is a high-erosion area and is characterized by bedrock and coarse grain sediment. There is no deposition of fine-grain sediment which is usually responsible for transporting the bulk of contaminants. Recently, it has been shown (Joshi, 1988) that the dominant flow of Lake Erie waters transports WNYNSC-derived radionuclides for deposition in the bottom sediments of Lake Ontario. A mass balance estimate showed that nearly all of the West Valley-derived ^{137}Cs is present in Lake Ontario sediments. The present communication reports the inventories and depth profiles of highly toxic $^{239,240}\text{Pu}$ and ^{241}Am in Lake Ontario sediment cores and examines the relative contributions of West Valley discharges and nuclear weapons testing fallout to the observed profiles. Bowen (1974) and Breteler *et al.* (1984) have previously reported on the transuranic ratios in the contiguous sections of the area sediment cores but have not assessed the relative contribution of each source. The results presented in this study clearly show that the area sediments are significantly influenced by transuranic discharges from the West Valley site.